

In the claims:

1. (Currently amended) A method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits, comprising:
  - preparing an inter-level dielectric substrate;
  - depositing a layer of Ru on the inter-level dielectric substrate;
  - depositing a layer of RuO<sub>2</sub> as a diffusion stuffer on the Ru layer;
  - repeating the depositing of a layer of Ru and a layer of RuO<sub>2</sub> at least once; and
  - depositing copper on the RuO<sub>2</sub> layer, wherein multiple layers of Ru and RuO<sub>2</sub> are deposited between the inter-level dielectric substrate and the copper layer.
2. Cancelled.
3. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 2, further comprising depositing the RuO<sub>2</sub> layer(s) on the Ru layer(s) using an atomic layer deposition technique.
4. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 2, further comprising depositing the RuO<sub>2</sub> layer(s) on the Ru layer(s) using a thermal oxidation technique.
5. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 2, further comprising depositing the RuO<sub>2</sub> layer(s) on the Ru layer(s) using an electrochemical technique.
6. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 2,

further comprising depositing the RuO<sub>2</sub> layer(s) on the Ru layer(s) using physical vapor deposition.

7. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 1, further comprising depositing the RuO<sub>2</sub> layer on the Ru layer using an atomic layer deposition technique.

8. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 1, further comprising depositing the RuO<sub>2</sub> layer on the Ru layer using a thermal oxidation technique.

9. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 1, further comprising depositing the RuO<sub>2</sub> layer on the Ru layer using an electrochemical technique.

10. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 1, further comprising depositing the RuO<sub>2</sub> layer on the Ru layer using physical vapor deposition.

11. Cancelled.

12. Cancelled.

13. Cancelled.

14. Cancelled.

15. Cancelled.

16. Cancelled.

17. Cancelled.

18. Cancelled.

19. Cancelled.

20. Cancelled.

21. Cancelled.

22. Cancelled.

23. Cancelled.

24. Cancelled.

25. (Currently amended) A method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits, comprising:

preparing an inter-level dielectric substrate;  
depositing one or a plurality of layers of RuO<sub>2</sub> directly on the inter-level dielectric substrate; and  
depositing copper on the RuO<sub>2</sub> layer.

26. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits of Claim 25, further comprising depositing the RuO<sub>2</sub> layer on the inter-level dielectric using an atomic layer technique.

27. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during fabrication of integrated circuits of Claim 25, further

comprising depositing the RuO<sub>2</sub> layer on the inter-level dielectric using an electrochemical technique.

28. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during fabrication of integrated circuits of Claim 25, further comprising depositing the RuO<sub>2</sub> layer on the inter-level dielectric using a thermal oxidation technique.

29. (Original) The method of controlling and containing copper diffusion during the integration of copper interconnects during fabrication of integrated circuits of Claim 25, further comprising depositing the RuO<sub>2</sub> layer on the inter-level dielectric using a physical vapor technique.

30. Cancelled.

31. Cancelled.

32. Cancelled.

33. (Currently amended) A method of controlling copper diffusion during the integration of copper interconnects during integrated circuit fabrication, comprising using Ru and RuO<sub>2</sub> alone as a diffusion barrier.

34. (Original) The method of controlling copper diffusion during the integration of copper interconnects during integrated circuit fabrication of Claim 33, further comprising eliminating a copper seed layer.

35. Cancelled.

36. Cancelled.

37. Cancelled.

38. Cancelled.

39. Cancelled.

40. Cancelled.

41. Cancelled.

42. Cancelled.

43. Cancelled.

44. Cancelled.

45. Cancelled.

46. Cancelled.

47. (Withdrawn) A method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits, comprising:  
    preparing an inter-level dielectric substrate;  
    depositing a layer of RuO<sub>2</sub> as a diffusion stuffer on the inter-level dielectric substrate;  
    depositing a layer of Ru on the RuO<sub>2</sub> layer; and  
    depositing copper on the Ru layer,  
    wherein the method eliminates the need for a copper seed layer.

48. (Currently amended) A method of controlling and containing copper diffusion during the integration of copper interconnects during the fabrication of integrated circuits, comprising:

    preparing an inter-level dielectric substrate;

depositing one or a plurality of layers of RuO<sub>2</sub> or Ru or a combination thereof,  
without additional elements, on the inter-level dielectric substrate; and  
depositing copper on the layer of RuO<sub>2</sub> or Ru or a combination thereof,  
wherein the method eliminates the need for a copper seed layer.